

Space News Roundup

April 5, 1982

National Aeronautics and Space Administration



It is 30 seconds to liftoff, and counting. A looming, tripple turreted STS starts to smoke on the pad.

It doesn't know that hundreds of us — from assemblers to astronauts — are watching the big screen in a darkened auditorium in Johnson Space Center.

It doesn't know that millions are watching at the Cape, Across America and around the world.

But as the work of all of us, it IS us; symbol of our working together to fashion human destiny through the limitations of our age.

Through the fire and thunder, rocket engines liberate STS from the pad and I feel free!

As it disappears into a cloud a baby cries in the auditorium and I wonder how he will use this inheritance;

What machines he may help conjure to carry him closer to God, himself, and the stars.

—Robert Goldman, SD2

Another for the books

STS-3 doubles airframe time, stirs scientists with experiments

It was the longest U.S. manned space flight since 1975, and with the time on *Columbia's* airframe more than doubled, program officials were calling the successful STS-3 mission the most important milestone yet in certifying the Shuttle system for operations.

The science community was also excited when *Columbia* touched down at White Sands, N.M., for aboard the spaceship were pathfinder experiments which proved that Shuttles will make excellent scientific platforms in the future.

But probably the most excited participants were Commander Jack Lousma and Pilot Gordon Fullerton, who made themselves at home in *Columbia* for approximately eight days and four minutes. Lousma called reentry "a great toboggan run," and said the flight itself "ranks as the great adventure of my life." Fullerton said his job was just to lower the landing gear and let Lousma make the speeches, but actually his participation was more crucial than he

would admit.

Fullerton became the first person to grapple a payload with the Shuttle's remote manipulator arm, and got so good at it that he was able to unberth the arm in about three minutes, and secure it in about four, a record which may stand for some time. He and Lousma also conducted a number of important scientific experiments, some of which, such as the electrophoresis equipment verification, are forerunners of much more advanced projects to come.

Minor glitches, the kind of space gremlins for which NASA crews and flight controllers prepare by engaging in thousands of hours of simulations, popped up during the flight, but despite the attention those problems got, the flight was at no time in danger of being shortened.

The biggest surprise, according to program officials, was not that there were communications difficulties, camera disorders and a malfunctioning toilet. Rather, the

biggest surprise was losing almost 40 tiles on ascent from two locations: on the nose of *Columbia* just above the forward reaction control system, and on the body flap at the extreme aft end of the spacecraft. NASA officials have not yet determined exactly why those tiles fell off, but speculation is that the culprit was either ice flying off the external tank or heavy aeroacoustic loads on ascent, or a combination of these factors. All of the lost tiles had not been densified with the ludox which increases their bonding strength, and none of the tiles came from areas critical during reentry. As many as a thousand tiles may be pulled off and densified before STS-4, now planned for sometime in June or July.

Scientific results included a number of measurements of the environment around the orbiter as it cruises through space, as well as an unexpected look at a solar flare thanks to the extra day *Columbia* spent in orbit when the winds at Northrup Strip whipped

up to 48 knots with zero visibility on the originally scheduled landing day. Preliminary science results include the following:

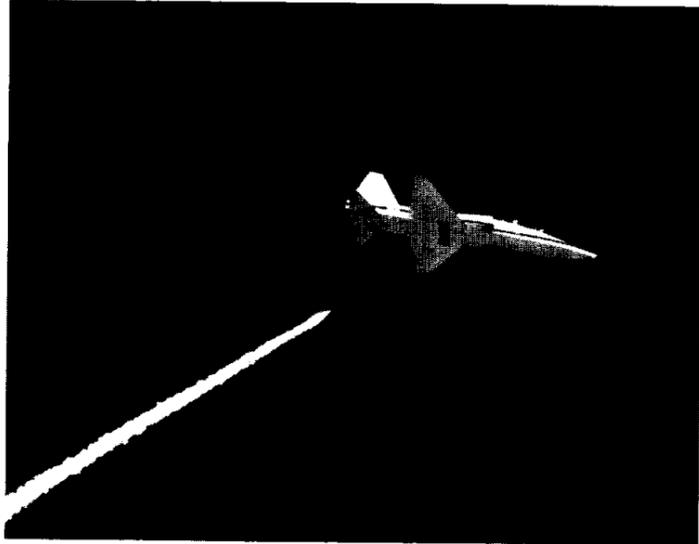
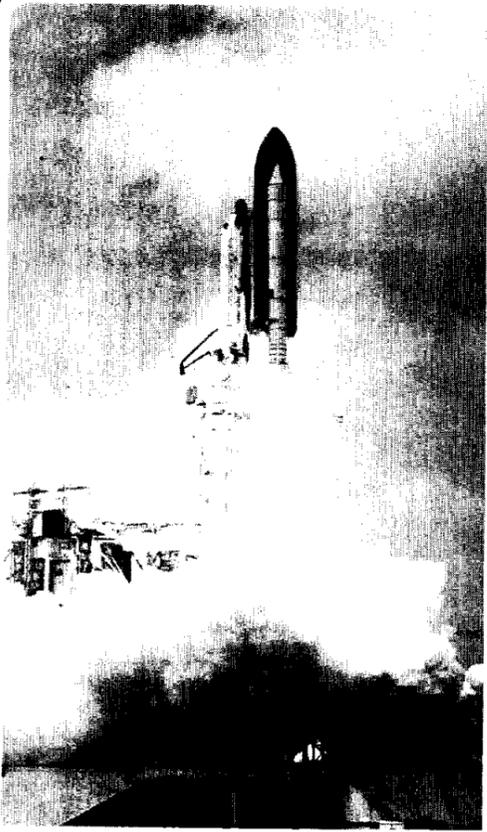
- The Plasma Diagnostic Package, the first payload to be grappled by the remote manipulator arm, measured the electromagnetic environment around the orbiter and also observed large changes in the gaseous medium, due to pressure and ionization, generated by and transported with the orbiter. The PDP showed that the orbiter's induced radio noise is within specifications and poses no problem for radio physics. The PDP was so sensitive it was able to detect water dumps from *Columbia*.

- The Vehicle Charging and Potential experiment, designed to study electrification phenomena on the orbiter, found that the orbiter electric potential is relatively constant at one to two volts. This indicates a fairly stable plasma density around the orbiter.

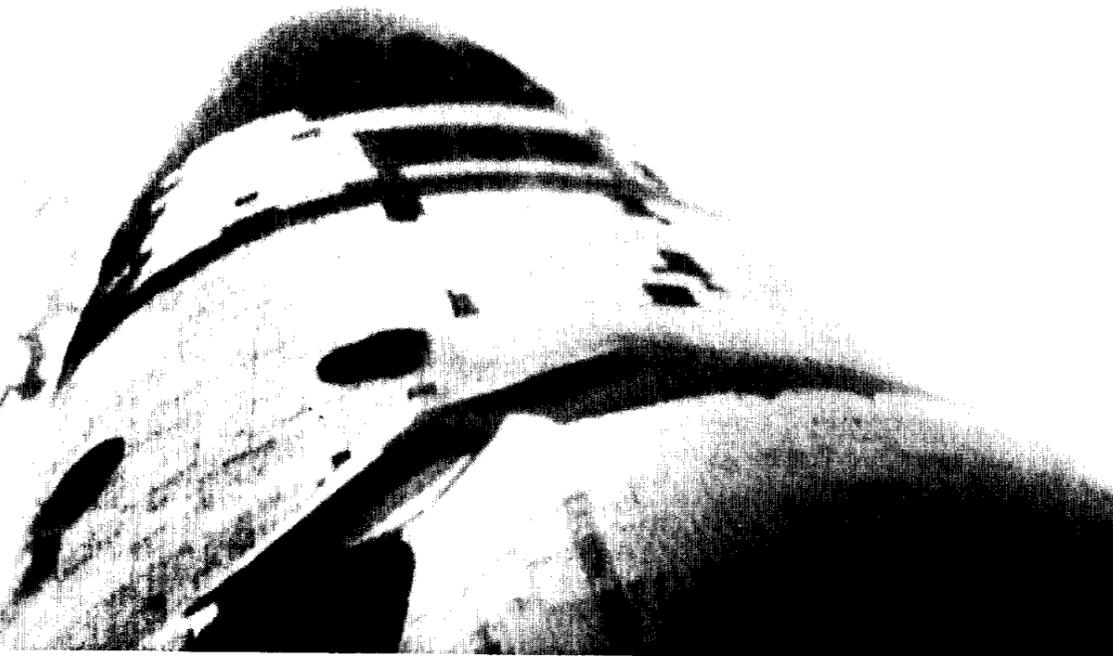
- The Shuttle Induced Atmosphere experiment, designed to see if the environment around the orbiter could interfere with some astronomical observations, revealed very high observed brightness, making observations difficult during daylight passes but possible during darkness. Zodiacal and diffuse galactic light were measured at night.

- The Contamination Monitor Package, sent up to study the accretion of particulates and correlate those with Shuttle activities, found contaminants at various orbiter temperatures, attitudes and times, but found the accretion rate to be typical of astronomical telescopes and relatively low.

- The Solar Flare X-Ray Polarimeter detected many X-ray flares and millions of flare X-ray photons. A coordinated solar flare watch with the National Oceanic and Atmospheric Administration was successful, and the experiment scientists were able to prove out a simple system for rejecting background detector noise.



Scen^es from a busy week included, counter clock-wise from upper left, a flawless liftoff which, despite an hour delay, was the first to come on the scheduled day; a view of the spacecraft roaring into orbit while a JSC chase plane (a T-38 piloted by Astronaut Richard O. Covey with Mission specialist Astronaut Ronald E. McNair doing the filming) chronicles its progress; video downlink of the Plasma Diagnostic Package deployment as viewed in Mission Control; the orbiter "humming along" over the Earth as seen from the remote manipulator arm elbow camera, which was being used to look for missing tiles; Commander Lousma and Pilot Fullerton in the midst of orbital duties with a Michigan banner hung up in the background; the Plasma Diagnostic Package, the first payload to be grappled and deployed by the mechanical arm in the Shuttle program; six-year-old Andy Fullerton watching his father from the viewing room in Mission Control during a live television downlink; and Fullerton himself reacting with mock amazement in one of the classic humorous moments during the flight—he had pulled a hairbrush out of the hygiene kit during a TV show Sunday morning, decided he had little use for it, and let the brush float off over his left shoulder while flight controllers hundreds of miles away in Houston howled with delight.



Interview

Ben Bova

OMNI's editorial director discusses the future

Ben Bova began his career with newspapers, but by the time he was 24, he had talked himself into a job with what is now the Martin Marietta Corporation as a junior technical editor working with the Vanguard project.

His starry eyes, he writes in his latest book, "The High Road" (Houghton Mifflin, 1981), "were quickly washed away by sweat, and then by tears of frustration.

"The Vanguard engineering team was ensconced in the loft atop one of Martin's manufacturing buildings. Summers are hot in the Baltimore area. And muggy. Our desks were located above machinery that used molten aluminum. On a summer morning, desk-top temperatures would be over 90° F before 8 a.m. Pigeons nested in the girders above us, and the desks were frequently spattered by their strafing runs. Oh, it was swell."

After an embarrassing debut — the first rocket rose four feet and detonated before a live television audience — Vanguard eventually boosted three small satellites into orbit. Ben Bova watched it all from the vantage point of an insider, and went on to make spaceflight and exploration the centerpiece of his career. He became a respected science fiction author and editor, and as the U.S. went to the moon and Mars and the outer planets, he worked as an aerospace industry executive, a screenwriter, a television consultant, a science lecturer and ultimately as editorial director of *Omni* magazine. The magazine now enjoys a circulation of over five million, and Bova is a leading figure in America's pro-space movement.

In Houston recently for a visit to NASA, Bova agreed to sit down and talk shop:

Roundup: This year, there will probably be some serious discussions, if not outright decisions, on such things as a fifth orbiter and the go ahead for building the Space Operations Center (SOC). Do you see a grassroots effort or a concurrent political effort to get involved in those decisions in a big way?

Bova: There is definitely a grassroots effort. It consists of literally hundreds of organizations all around the country. I'm a director of the National Space Institute, for example, and also a member of the L-5 Society and the Planetary Society. Those are three of the biggest ones, but there are hundreds of smaller groups, very local, that are now working together. There is a national coordinating committee for space. And in the "First Word" section of this month's *Omni* (March), I tell the readers about a bipartisan space caucus that has been started in the House of Representatives. So I think on the political level, the grassroots movement is having an effect. Now on the commercial and industrial level, you have everyone from Bob Anderson, the president of Rockwell, on down to individual entrepreneurs who are very interested in the commercial and industrial aspects of space. Right here in Houston you have Space Services, Inc., which tried to launch their own rocket and will be back with another. They intend to be in the business of launching satellites for profit. So there is growing interest and growing strength, both among the general public and at the local and business levels. The polls that people like Roper and Gallup and AP are doing have shown a consistent growth in the public's support of space, and in fact, I think the grassroots movement is largely responsible for the administration



Bova: "There is no real organized opposition to NASA."

making the NASA budget \$6.6 billion this year instead of the much lower figure that had been first proposed.

Roundup: Is that a budget proposal which can carry through Congress?

Bova: Yes. There is considerable support. There will be some slicing of that budget, but it will be cosmetic, I believe. What the grassroots movement has done in particular is save Galileo. And what the industrial group is going to be doing is showing the government that there is private support for space operations. And the government, since this is a very business-minded administration, I believe will continue to provide the cutting edge for this technology. It's very much like earlier technologies, with the railroads and with aircraft — the government did much of the early risk taking, and then private entrepreneurs moved in. So that's what's happening in space. And up until last year, the cry in Washington and elsewhere was "Where's private business?" People have been saying this will be profitable and exciting for businessmen. Well, they're coming in now. When you've got an organization like (the Space Transportation Co. Inc. of Princeton, N.J.) offering to raise one billion dollars to build a shuttle, that's a significant event. I think it's the biggest story in the American space program this year.

... on that happy day, we have assured the survival of the human race ...

Roundup: What is your reading of the reaction in Washington to that purchase proposal?

Bova: They are afraid of certain aspects of the proposal. The proposal says "We'll raise the money, you provide the shuttle, we'll provide the commercial payloads; however, you have to guarantee us a certain launch rate. And if you don't, then you NASA, or the U.S. Government, pay the losses incurred." Now that — I was talking

to Dr. Mark (NASA Deputy Administrator) about that, and we sort of concluded that what will happen is the government's lawyers and the private lawyers will work it out in negotiation. Clearly these guys are not coming in with a deal that would hurt them. But they're not going to get that kind of deal right off the bat. But it is do-able. I don't see that you'll have an agreement this spring.

Roundup: If financial backing is not the big problem, then what about actually operating a shuttle under those circumstances?

Bova: That's a question the government must decide. Is the shuttle going to be operated by NASA? Is NASA going to turn into a transportation company? That would be disastrous. Is the shuttle going to be operated by the Air Force, including its civilian flights? That would be perfectly do-able, but I think terrible propaganda. I suspect the smart money is betting on the idea that the government will initiate a quasi-governmental private corporation like COMSAT which will operate the shuttle.

Roundup: Is there a mechanism in place which can pull all of these things together?

Bova: No, I don't think so. I don't believe so at all.

Roundup: That is yet to be created.

Bova: Yes. And it's a very exciting time, really. Because we are seeing the United States space

know full well that once American business gets into space, they'll go light years, literally, ahead of the Soviet program.

Roundup: So where should NASA be as far as operating the shuttle goes?

Bova: I don't think NASA should be an operational outfit. I think that would warp the agency out of shape. NASA is very good at R & D, and that's what it should be doing.

Roundup: How do you see *Omni's* role in promoting public opinion and public action regarding the space program? Will there be petitions and the like from *Omni*?

Bova: There have been petition drives in the past. The more petitions you do, the less productive they are. *Omni's* role, first of all, stems from the interests of those who publish it. But also from the fact that our readers made it clear very early in the magazine's existence that they expected us to play a role, not just to be a magazine reporting on what is happening, but to act as a focal point for information dissemination and to some extent support the various organizations, and to put pressure on in Washington — to act as a voice. We've got five and a quarter million readers, and I guess all but six of them are really crazy about space. And those six keep quiet.

Roundup: And some of *Omni's* readers are very influential people.

Bova: Yes. What I have found in Washington is that no one is really against the space program. There is no real organized opposition to NASA. It's a matter of many people being indifferent, and most people in the Congress feeling that the space program is a luxury that we may not be able to afford.

Roundup: Is that a holdover from the space program cuts of the last decade?

Bova: No, I think it was a very clever political ploy foisted by some past leaders. This whole either-or business. That if we spend money on space, we take food out of the mouths of starving kids in Harlem. Well, that's just nonsense. The space program has made more jobs, and put more people to work than anything the government has done. And I'm not just talking about jobs for engineers. I'm talking about jobs for the guys who sell engineers their automobiles and groceries, and the whole community in which the engineer lives. There are truck drivers involved in the space program.

Roundup: Do you think the political climate is such that sometime in this decade we will see a "Manhattan Project for space?"

Bova: Only if the people perceive an enormous threat that could be met with a stronger space program. I would like to see the deployment of the Space Operations Center. I think that's the next logical step. With the exception of the people who are really focused entirely on planetary science, the SOC makes sense for almost every other group, no matter what their goals are. The L-5 Society wants to build colonies in space and solar power satellites. Other groups want to do other things in space. But all of these efforts involve that first step of putting a center in orbit that will be your point of operations. And that, I think, will be the next big statement. We may get President Reagan to make that a new start.

Roundup: How would you rate the chances for that?

Bova: Pretty slim, frankly. But it would be an initiative that he could propose and begin right now. And as the shuttle leaves the testing

phase and goes operational, it's the next thing to do. Especially if they set up a separate entity to operate the shuttle. Then the NASA decks will be cleared for another big objective, and SOC is it.

Roundup: You've also expressed some interest in the construction of a heavy lift launch vehicle. Should SOC be in place first?

Bova: I think the two probably go together. The scenario I would predict, and it'll probably be wrong, but you can do a first step to a Space Operations Center with the shuttle as the primary lifting and hauling device. As you begin to get more sophisticated, and you realize all the things you can do in that Space Operations Center, and industry wants to get up there and put in heavier and heavier payloads, then you have the basis for building a heavy lift launch vehicle and adding to your SOC, or building others. Eventually, you realize you are putting so much in orbit that it would be cheaper to put a few bulldozers on the moon and start smelting the stuff and bringing it down to Low Earth Orbit. And on that happy day, we have assured the survival of the human race, no matter what happens on the planet Earth. People will be living out there.

Roundup: James Michener said the hiatus we seem to be embarking on in planetary exploration is nothing to be alarmed about. He says fifteen years is nothing, it's a weekend. What do you think about that?

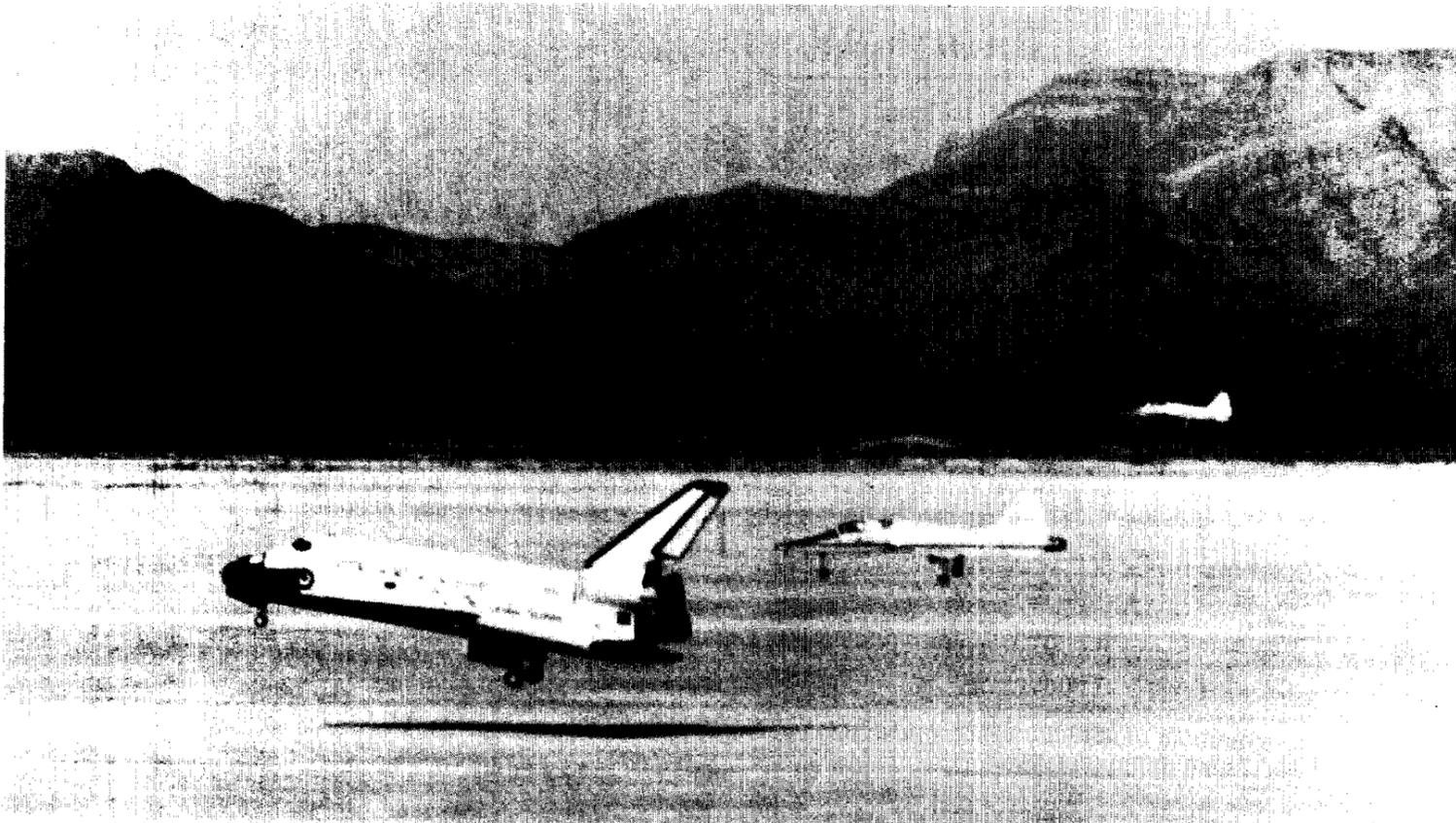
Bova: Fifteen years can be the difference between survival of a society and its death. And we are not making any strong moves toward our own survival.

Roundup: Would planetary exploration help us do that?

Bova: Not by itself. And this is something that Carl Sagan and Bruce Murray (JPL Director) have never been able to figure out. That the American public which pays their bills will not support a program that consists of nothing but planetary exploration. It's wonderful to look at these photos of Jupiter and Saturn, but it doesn't put any bread on the table, at least in the view of the average taxpayer. The American taxpayer is, however, quite willing to pay for a program of manned space exploration, of going to the moon, of building orbital centers in space, of bringing industry into space, of using space to help solve the economic problems here, and that will include planetary exploration. It will go along as it always has gone along, as a sidebar to what the public really wants to see done.

Roundup: Is that why space interest groups have sprung up? To keep man in space? Or is the reason more fundamental — survival of the species?

Bova: I think it is more than both of those put together. There are lots of different reasons. But one of them is, as I said in "High Road," on the tenth anniversary of the landing on the Moon, I would never have predicted that we would be so far behind ten years later. I think a lot of people on that tenth anniversary began to think, "You know, we've just wasted a whole decade." All sorts of things could have been done, and should have been done. And they began to realize that the only way they are going to get done is if we the people insist on it. It's corny as hell, but it's very true: the people in this country have the power. They very seldom use it. We generally see it used in the form of special interest groups. Well, now there's the space interest group, and it's beginning to show results.



After an incredible "toboggan run," STS-3 Commander Jack Lousma greases Columbia in for a landing at Northrup Strip.

Cookin' in the Cafeteria

Week of April 5 - 9, 1982

Monday: Cream of Chicken Soup; Beef Burgundy over Noodles, Fried Chicken, BBQ Sausage Link, Hamburger Steak (Special); Buttered Corn, Carrots, Green Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef Noodle Soup; Baked Meatloaf, Liver & Onions, BBQ Spare Ribs, Turkey & Dressing (Special); Spanish Rice, Broccoli, Buttered Squash.

Wednesday: Seafood Gumbo; Broiled Fish, Tamales w/Chili, Spanish Macaroni (Special); Ranch Beans, Beets, Parsley Potatoes.

Thursday: Navy Bean Soup; Beef Pot Roast, Shrimp Chop Suey, Pork Chops, Chicken Fried Steak (Special); Carrots, Cabbage, Green Beans.

Friday: Seafood Gumbo; Broiled Halibut, Fried Shrimp, Baked Ham, Tuna & Noodle Casserole (Special); Corn, Turnip Greens, Stewed Tomatoes.

Week of April 12-16, 1982

Monday: Chicken Noodle Soup; Weiners & Beans, Round Steak w/Hash Browns, Meatballs & Spaghetti (Special); Okra & Tomatoes, Carrots, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef and Barley Soup; Beef Stew, Shrimp Creole, Fried Chicken (Special); Stewed Tomatoes, Mixed Vegetables, Broccoli.

Wednesday: Seafood Gumbo; Fried Perch, New England Dinner, Swiss Steak (Special); Italian Green Beans, Cabbage, Carrots.

Thursday: Cream of Chicken Soup; Turkey & Dressing, Enchiladas w/Chili, Weiners & Macaroni, Stuffed Bell Pepper (Special); Zucchini Squash, English Peas, Rice.

Friday: Seafood Gumbo; Baked Flourider, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, Whipped Potatoes.

Bulletin Board

NACA reunion plans being finalized

Special air fares from Houston and various other cities have been obtained for those wishing to travel to the 2nd National Advisory Committee for Aeronautics reunion in Williamsburg, Va. Nov. 12-14. The Hilton Conference Center on Route 60 in Williamsburg has been reserved for the gathering, and a package deal has been arranged to cover lodging, meals and entertainment for Friday through Sunday brunch. Special rates will also be available for touring Colonial Williamsburg, and golfers can arrange to play at nearby Kingsmill Golf Course in the lush countryside of the Peninsula. Buses or rental cars will be available for shopping trips to the Williamsburg Pottery, the Village Green Shops and the new Kingsmill Shops. Attendees may also revisit NASA's Langley Research Center, the original home of the Space Task Group nucleus which later helped form the Johnson Space Center. Both NACA retirees and NASA employees who worked for the NACA are welcome to participate. For a reservation form or more information, write NACA Reunion Committee, 20 Lakeshore Drive, Newport News, Va. 23602, or call (804) 722-8454 or (804) 722-8768.

AIAA symposium and dinner scheduled

"Space Shuttle Development and Flight Results" will be the theme of the 7th Annual AIAA Technical Mini-Symposium, to be held April 20 in the Gilruth Recreation Center. The symposium will be followed at 6 p.m. by a social, at 7 p.m. by dinner, and at 8 p.m. by a program featuring Joseph G. Gavin, Jr., President of Grumman Corp., who will speak on "Planning Priorities and Politics." The reservation deadline for the dinner is noon April 16. All are welcome, dinner cancellations are required. Ticket prices for members and spouses is \$7.50 for the beef mandarin dinner,

\$8.50 for non-members and \$2 discount for student members and non-members. There is no charge for attending the program only. Dinner reservations can be made by calling Nancy at NASA, x3995; Hazel at Lockheed, 333-6161; Joanne at Rockwell, 333-2030, x211; or Sylvia at College Station, 845-7541.

First JSC Blood drive is Thursday

The first JSC-sponsored blood drive of 1982 will be held April 8 in the Gilruth Center. Donors should eat a low-fat meal within four hours prior to donation, and the age limit is 18 through 65, 17 with signed parental consent, and over 66 with Doctor's permission. For appointments or more information, call Bob Jones, x6364, or Jim McBride, x6226.

NARFE schedules April meeting

NASA Area Chapter 1321 of the National Association of Retired Federal Employees will meet at 1 p.m. April 6 in the Clear Lake Park Bldg. on NASA Road One. George Meador, Galveston County Extension Agent, will speak on the care of lawns, flowers, shrubs and trees. Refreshments will be served during the social hour. For more information, call Burney Goodwin at 334-2494.

UH/CLC Community Orchestra concert set

The University of Houston/Clear Lake City Community Orchestra will appear in concert with the UH/CLC Dance Collective at 8 p.m. April 17 in the Bayou Bldg. auditorium on campus. The Vivaldi Concerto in E will be featured, and the orchestra will also perform Beethoven's "Edgmont Overture," Sibelius's "Pelleas and Mellisande," and Wagner's "Siegfried Idyll." Adult tickets are \$3, student and senior citizens tickets are \$1. For more information, call W. F. Meek at x4851.

Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP3 Roundup, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Property and Rentals

Spacious 4-2 1/2-2 1/2 on assumable VA for sale by owner, located on wooded lot in El Lago near lake. Call 538-1313 evenings.

For sale: 3-2-2 close to park and pool in League City. Call 554-2790.

For sale: 1/2 acre in downtown League City, hugh oak trees. Call 554-2790.

For lease: League City 3-2-2 house, fenced yard, no pets, \$525/mo. Call Tom Clarry, x5971 or 334-4459 before 2 p.m.

For rent: horse pasture, stalls and tack room, on pavement, convenient to Friendswood, \$40/mo. Call 482-7079.

For sale: Heritage Park, new 3-2-2, extra large lot in cul-de-sac, fenced, microwave, fans, 12 1/2 % FHA, \$18,750 equity. Call John, x5301 or 482-8457.

For sale: 3-1 1/2-1 in Deer Park, landscaped yard, all brick, central air and heat, good rental property or first home, equity 7% FHA. Call 479-5594.

For lease: Heritage Park 3-2-2, 1 year old, extra large LR, formal DR, fireplace, fenced, microwave, \$595, 1st. last and \$200 deposit. Call 488-4613.

Cars & Trucks

1975 Chevrolet van, very good condition, camper conversion, small V-8 engine, 3/4 ton LW base, 36,000 miles, \$3,500. Call 488-1118.

1967 Chevelle SS, 396 manual 4-speed, service manual, mint condition, original owner. Call 488-7668.

1974 VW Dasher, runs well, needs body work, \$500. Call Mike, 482-1228 evenings.

1978 Olds Cutlass Brougham, clean, V-8, PS, PB, cruise, auto, AC, AM/FM Cassette, \$3,600. Call Robin, x4614 or 481-3243.

1977 Dodge pickup, 6 cyl., standard shift, short bed, radio, heater, 50,000 miles, \$2,600. Call x3651 or 488-8682 after 4 p.m.

1978 Toyota Celica GT, 5 spd., AM/FM, AC, cruise, wire rims, targa top, low mileage, \$4,950. Call Ann, x4905 or 488-0368 after 4:30 p.m.

1975 Mazda pickup, 69,000 miles, AC, radio, runs OK but needs mechanical work, must sell, \$1,000. Call Jeff, x3816.

Ford 351 CID (Cleveland) engine with FMX automatic transmission, all in good working condition. Call 333-3665.

Cycles

Puch moped, 1.5 Hp, 49.9 cc, low mileage, very good condition, \$300. Call 488-8282 after 6 p.m.

1979 Yamaha YZ125, \$500. Call Pat Loftus, 482-5432.

1980 Honda 400 CMT, burgundy color, less than 1,300 miles, excellent condition, \$1,600 firm. Two helmets go with purchase. Call 486-8459.

1972 400 cc Husqvarne, motocross, good shape, all offers considered. Call Reeves, x2991 or 482-7233

1971 Honda K750, saddle bags, luggage rack, good tires, new tune up, brakes and front fork seals, \$700 or best offer. Call Ray, x2001.

1973 Yamaha LT-3, 100 cc, street legal, 2,450 miles, excellent condition, \$285. Call Bourland, x3881 or 488-5580 after 5 p.m.

1973 Honda XL250, 15,500 miles, windshield and luggage rack, \$300. Call Roly Rice, x4027 or 481-3451.

1976 Honda 750 SS, 6,000 miles, excellent shape, full windscreen, helmet, bought new in 1978, \$1,395. Call John, x5301 or 482-8457.

1978 Honda 750K, Windjammer, Bates saddle bags, luggage rack and back rest, \$1,800. Call 471-0112.

Boats & Planes

1/5 share in 1979 Grumman Tiger. Based Clover, equity plus \$120 per month obligation. Call Hal, 749-5496, days.

Use my super equipped Skyhawk or Bonanza for hourly share of expenses, save \$ and scheduling hassle; pilot time minimums: 300/10 (Skyhawk), 500/100/25 (Bonanza). Call Bill Pruett, x4491 or 487-3857 after 5 p.m.

1975 Skyhawk 1/4 interest, excellent partnership for last 7 years, Narco IFR w/HSI, DME, 2 axis A.P., based at La Porte, \$6,000 firm. Call Pruett, x4491 or 487-3857 after 5 p.m.

17 1/2 ft. SeaRay, 12 Hp, Mercruiser I/O, big wheel galvanized trailer, good shape, \$2,300 negotiable. Call Reeves, x2991 or 482-7233.

1976 Century Arabian 17 ft. boat, 351 Ford inboard custom engine, w/trailer, excellent condition, \$6,000. Call 477-6897 or 472-7105, evenings.

Four plus two Olympic-class racer, main plus jib, galv. trailer, \$1,300, negotiable. Call Dan, x2091 or x4868.

Windsurfer rocket-type board with footstraps, carbon fiber reinforced mast, good deal at \$750; Sailfish at \$300 or best offer. Call Jeff Hoffman, x2421 or 538-1643.

1952 Chris Craft Commander 42 ft. yacht/fisherman, twin 471 Detroit diesels, good condition, insured. Call Stan, 334-1610 after 4:30 p.m.

Household

Early American living room group; sofa, love seat, rocker and ottoman, excellent condition, \$550. Call 332-4184 after 5 p.m.

Walnut drop leaf antique table, beautiful, \$400; king-size bedroom suite with box springs and mattress, \$275. Call 488-5564.

White mini-blinds (35" x 36"), \$20; bay window curtain rod, \$10; miscellaneous shades and drapes reasonably priced. Call 332-8328 after 5 p.m.

Kitchen set, 6 chairs, modern; light fixtures; Kirsch drapery rods; medicine cabinet. Call 333-4669.

Two large gold lamps, \$30 each; new electronic baseball game, \$10; Johnny Bench batting tee, \$4. Call Lapko, x5285.

Refrigerator, 18 cu. ft. Whirlpool frost-free, top freezer with ice maker, avocado green, excellent condition, \$150. Call Lois, x3005 or 479-7815 after 6 p.m.

Musical instruments

RMI electric piano/organ/harpichord/lute, ideal for combo or church choir, very good condition, \$500. Call 334-4894.

Back Stradivarius trumpet, silver, with a first valve trigger, third valve slide, excellent condition, just like new, \$500, mutes included. Call Kim, x4678 or 944-6164 after 5 p.m.

Music Man Sting Ray bass guitar w/case, excellent condition, \$550. Call 481-0046.

Miscellaneous

Pan Am International 2 for 1 coupon good to May 31, good for foreign travel, trade for 19" color TV, anything of equal value, or cash. Call 488-5564.

Used bassinet w/matching cover, mattress cover, blanket and pillowcase, clean and in excellent condition, \$15. Call Sara, x3801.

Fly Pan Am International 2 for 1 coupon to May 31, \$50. Call Doris Wood, x4465 or 333-2373 evenings.

Tan van bench seat, reclines into bed, excellent condition, \$75; Sanyo stereo cassette deck, good condition, \$45. Call Mullis, x3762 or 339-2056.

Lowboy trailers, like new, tandem 16' x 6'; no springs, \$600, with springs, \$725. Treated wood, 2" ball, fenders. Call 337-1957, evenings.

New crossover tool box, fits all small pickup trucks, 1/2 price. Call Lewis, x2896 or 337-5748.

Sears 10" radial arm saw, 1979 model, like new, \$300. Call 482-4941.

Recreational vehicle built-in oven/range, LP or natural gas, very clean, works well, \$75. Call x5316 or 559-2325 after 6 p.m.

Two Pan Am 2 for 1 coupons, valid anywhere on Pan Am, \$50 each or will trade. Call 481-2665 or 947-0644.

20 foot Layton camper, sleeps 6, self-contained, AC, tarp, jack stands, extra electric cable, water hose, all for \$4,995. Call Larry Jones, 644-3801 or 337-1854 after 5 p.m.

15 amp 6 volt battery charger, \$15; Simpson model 390 AV volt-amp/wattmeter, \$50; Sears AM/FM car stereo w/8 track tape player, \$100; 4 burner Tappan table top stove, \$20. Call Girala, x4643 or 921-7212.

Video & Audio

Quadraphonic AM/FM stereo multiplex receiver, 8 track tape, BSR 3-sp. turntable, 4 separate speakers, like new, \$100. Call Lamb, x4671.